Personality change via work:

A job demand-control model of big-five personality changes

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Abstract

Based on the job demand-control model and Gray's biopsychological theory of personality, the author proposed a model to suggest that time demand and job control can drive changes in big-five personality traits, especially neuroticism and extroversion, by shaping an individual's stress experiences at work. Five waves of data from 1,814 employees over a five-year period from the Household, Income and Labour Dynamics in Australia Survey were analyzed. Time demand, job control and job stress were measured in all five waves, and big-five personality was assessed in the first and last waves. The results showed that time demand and job control shaped job stress positively and negatively at a given time; and over time, an increase in time demand predicted an increase in job stress, which subsequently predicted an increase in neuroticism and a decrease in extroversion and conscientiousness. Results also showed that an increase in job control predicted an increase in agreeableness, conscientiousness, and openness directly, but did not predict change in neuroticism and extroversion. Finally, the buffering effect of job control on the association between time demand and job stress was only observed in two of five waves and such buffering effect was not observed in a change process. The implications on personality development and work design research are discussed.

Keywords: personality development, work design, job demand-control model, job stress, longitudinal data analysis.

Personality change via work: A job demand-control model of big-five personality changes

Big-five personality traits have been widely regarded as static dispositional characteristics that cannot change (McCrae & Costa, 2008). Nevertheless, recent studies have indicated that people change their big-five traits across their life span, even in adulthood (e.g., Roberts, Walton, & Viechtbauer, 2006). To explain why such changes would occur, especially in adulthood, work environment/experiences have been proposed and were found to be a factor driving personality change (e.g., Hudson, Roberts, & Lodi-Smith, 2012; Lodi-Smith & Roberts, 2007). This change occurs because work is a major part of adult life, and work environment/experiences can shape one's values, social roles and activities on a daily basis. Over a period of time, experiences at work will shape how an individual thinks, feels and behaves that gradually become enduring attributes of one's personality (Frese, 1982; Li, Fay, Frese, Harms, & Gao, 2014; Wu, Griffin, & Parker, 2015), suggesting a bottom-up process in driving personality change. However, findings have demonstrated null effects of work environment/experiences on personality development (e.g., Sutin & Costa, 2010). These mixed findings suggested the need to delve more deeply into the role of work in shaping personality change over time.

If we looked into the research design of previous research, we would not be surprised to observe different findings on the role of environment/experiences on personality change in various studies. Previous research used different time lags and work-related constructs, factors that can result in different findings. For example, in terms of time lag, Hudson et al. (2012) used 2.5 years, Sutin and Costa (2010) used 10 years and Wille and De Fruyt (2014) used 15 years. In terms of research variables, Hudson et al. (2012) focused on attitudinal and behavioral work-related constructs (e.g., job involvement and organizational citizenship behaviors); Sutin and Costa (2010) focused on job characteristics only (e.g., decision latitude and job demand); and (Wille & De

Fruyt, 2014) focused on occupational characteristics based on Holland's (1959) framework. In other words, these studies do not share a research design and, thus, can result in different findings.

Moreover, these studies have common limitations that prevent us from fully understanding the role of work environment/experiences in personality change. Specifically, previous research (e.g., Hudson et al., 2012; Sutin & Costa, 2010; Wille & De Fruyt, 2014) primarily examined the cross-lagged effect of environment/experiences assessed in previous years on personality traits evaluated in later years with an assumption that exposure to certain work environment/experiences at a given point can lead to personality change in later years. However, an individual would be more likely to change his or her ways of thinking, believing, feeling and behaving to adapt to environment/experience changes (Savickas, 1997, 2005). In other words, changes in work environment/experiences would be more critical to drive personality change, which has not been examined to date. Additionally, why environment/experiences can lead to personality change has rarely been examined because previous research primarily focused on the main effects of work environment/experiences on personality change. Although a bottom-up process has been used to explain why work environment/experiences can drive personality change (e.g., Li et al., 2014; Wu et al., 2015), a bottom-up process has not been empirically examined and, thus, the validity of the bottom-up process explanation is unknown.

To address the above concerns and extend previous research, in this study I relied on a job demand-control model (Karasek, 1979) and extended it to explain why work environment/experiences can evoke a bottom-up process to shape Big-five personality change. As elaborated shortly, I proposed a specific bottom-up process in which changes in job control and job demands will lead to changes in job stress over time, which in turn will lead to changes in Big-five personality traits, especially in the traits of neuroticism and extroversion. With this proposed

process, I thus suggested that the work environment can gradually evoke personality change by influencing an individual's state of stress experiences over time.

Job demands, job control and job stress

Job stress is the "uncomfortable feeling that an individual experiences when he or she is forced to deviate from normal or desired patterns of functioning…in the workplace" (Summers, DeCotiis, & DeNisi, 1995, p. 114). The association between job demands, job control and job stress has been well articulated in the job demand-control model (Karasek, 1979). Job demands refer to "physical, social, or organizational aspects of a job that require sustained physical and psychological effort" (Schaufeli, Bakker, & Rhenen, 2009, p. 894). Higher demands usually turn into job stressors because meeting higher demands requires more effort that employees may not have enough capacity or energy to deliver. Although employees can maximize their effort to meet higher demands, the depleted effort may not be adequately recovered (Meijman & Mulder, 1998; Sonnentag & Zijlstra, 2006). As such, job demands have been consistently linked to stressed experiences, such as burnout, fatigue or health problems (e.g., Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). Typical job demands include work load and time pressure (Karasek, 1979) but are not exclusive from other types of demands, such as role conflict (e.g., Wu, 2009). In this study, I focused on time pressure specifically because it is the core element of job demands in the job demand-control model and it overwhelmingly heightens physical, cognitive, and emotional effort to complete work by forcing individuals to work exhaustively, be intensely focused, and feel anxious. Time pressure has been positively linked to stress experiences (e.g., Demerouti et al., 2001; Höge, 2009).

In contrast to job demands, job control or job autonomy has been negatively linked to job stress. Job control refers to the latitude of freedom that employees can decide what, how and when to do their work (Hackman & Oldham, 1976; Karasek, 1979). Employees with higher autonomy

at work tend to have less job stress because technically they can arrange work activities based on their schedules, preventing situations such as task interference that can result in stress. Additionally, because higher job control provides opportunities for employees to determine their work activities, it enables employees to choose work goals based on their interests or values (or self-concordant goals) (Sheldon & Elliot, 1999) that facilitate autonomous goal regulation at work and save energy from being depleted (Ryan & Deci, 2008). Moreover, higher job control can fulfill employees' basic needs (i.e., need for autonomy, competence and relatedness), which facilitate optimal function for employees to cope with the work environment and experience better adjustment (Baard, Deci, & Ryan, 2004). Empirically, job control has been negatively related to job stress (e.g., Landsbergis, 1988; Schaufeli et al., 2009). To comprehensively represent the concept of job control, I focused job control at a broader level that incorporates decision-making autonomy, work-method autonomy and work scheduling autonomy (Morgeson & Humphrey, 2006), which correspond to the freedom to determine what, how and when to do one's work.

Job control, according to the job demand-control model (Karasek, 1979), also plays a role in moderating the association between time demand and job stress such that employees with higher job control are less likely to be stressed out when facing higher time demand. The main reason is that higher job control allows employees to determine tasks and goals at work, to use alternative approaches to do their work and to arrange activities according to their own schedules, helping employees find a better way to complete their work under time pressure and thus avoid task clash or role conflict and prevent job stress. This buffering effect of job control has been empirically supported (e.g., Karasek, 1979; Wall, Jackson, Mullarkey, & Parker, 1996).

Based on the job demand-control model and also on previous findings, I thus expected that when employees have a higher time demand, they will experience higher job stress and that when employees have higher job control, they will experience lower job stress. I also expected that job

control will weaken the association between time demand and job stress in a given time due to its buffering effect. As job control and time demand shape stress experience at a given time, changes in job control and time demand can also lead to changes in stress experience over time such that employees are expected to experience more or less job stress when their time demand or job control increases, which has been partially supported in previous research (e.g., Schaufeli et al., 2009). Following the same logic, it is also likely to observe the buffering effect of job control in a change process such that employees are less likely to experience more stress over time when time demand increases if the level of job control has increased at the same time. To formally test the concurrent associations of time demand and job control with job stress and their longitudinal associations in a change process, I thus proposed the following:

Hypothesis 1: In a given time, time demand will have a positive predictive effect on job stress, and job control will have a negative predictive effect on job stress.

Hypothesis 2: In a given time, there will be an interaction effect between job control and time demand on job stress such that the positive association between time demand and job stress will be weaker when job control is higher.

Hypothesis 3: Over time, increased time demand will have a positive predictive effect on increased job stress, and increased job control will have a negative predictive effect on an increased job stress.

Hypothesis 4: Over time, there will be an interaction effect between increased job control and increased time demand on increased job stress such that the positive association between increased time demand and increased job stress will be weaker when job control increased in the same time period.

Change in job stress and personality change in neuroticism and extroversion

Based on Gray's biopsychological theory of personality (1981; 1990), I proposed that a change in job stress can facilitate changes in big-five personality traits, especially neuroticism and extroversion. According to Gray's theory (1981; 1990), there are two systems, the behavioral inhibition system (BIS) and the behavioral activation system (BAS), that regulate an individual's behavior and emotion. Specifically, the BIS is sensitive to signals of punishment and is responsible for the experience of negative feelings (i.e., anxiety and frustration) and inhibit actions that may lead to negative consequences. In contrast, the BAS is sensitive to signals of reward and is responsible for the experience of positive feelings (i.e., happy and energetic). Because people vary in the operation of these two systems, the operation of the two systems thus renders an individual's personality, which represents one's idiosyncratic pattern of feeling and behaving. For example, the BIS system has been positively linked to neuroticism and negative affectivity due to its governance of vulnerability and avoidance of negative events (Elliot & Thrash, 2002). The BAS system has been positively linked to extroversion and positive affectivity, due to its governance of the enjoyment of and approach to positive rewards (Elliot & Thrash, 2002).

Based on Gray's framework (1981; 1990), I propose that changes in job stress will specifically facilitate changes in neuroticism and extroversion via its influence on the operation of behavioral inhibition system (BIS) and behavioral activation system (BAS). Because increased job stress reinforces uncomfortable feelings, depletes self-regulatory energy to pursue desired goals and enhances potential negative consequences (e.g., job loss or health impairment) (e.g., Beehr & Newman, 1978; Sonnentag & Jelden, 2009), it will intensify the operation of BIS and deactivate the operation of BAS. Intensifying the operation of BIS will lead employees to be more neurotic, with emotional and behavioral syndromes, such as worrying and becoming easily irritated. Deactivating the operation of BIS will lead employees to be less extroverted with emotional and

behavioral syndromes, such as lacking energy to seek excitement and being sluggish to initiate social interaction with others. Based on the above reasoning, I thus proposed the following:

Hypothesis 5: Over time, increased job stress will have a positive predictive effect on an increase in neuroticism and a decrease in extroversion.

The present study

To examine the hypotheses altogether, I used the data from the Household, Income and Labor Dynamics in Australia (HILDA) Survey (Summerfield, 2010) and extracted the data from 1,814 participants who were employees from 2005 to 2009 and provided responses on time demand, job control and job stress each year. They also rated their Big-five personalities at trait level in 2005 and 2009. As expression of personality can vary from trait to state levels (Fleeson, 2001) and the focus of this study is on personality change at trait level, using the trait measure of Big-five personality is appropriate for this research. As such, this dataset allowed me to examine the concurrent and longitudinal association between time demand, job control and job stress and the predictive effect of changes in job stress on changes in neuroticism and extroversion. To control for the effect of personality in shaping the perception of work environment, I included such dispositional effects in the research model as reported shortly. Additionally, I used a model comparison approach to examine whether the proposed bottom-up process was more plausible than an alternative model. Finally, although only changes in neuroticism and extroversion were hypothesized, I included agreeableness, conscientiousness and openness in the analysis to explore their potential effects with the focused job-related variables.

Method

The HILDA Survey

The data from the HILDA survey (Summerfield, 2010) were used. The HILDA Survey is conducted annually with a nationally representative sample recruited in 2001. I used the data from

2005 to 2009 (denoted as Time 1 to Time 5) because big-five personalities were assessed in 2005 and 2009 only. The HILDA survey consists of face-to-face interviews and self-completion questionnaires (please see Watson & Wooden, 2007, for details). The variables used in this study were assessed in the self-completion questionnaire.

The participants in the current study included those who: (a) were employees (self-employed participants were not included); (b) had complete data points in the five years of study; and (c) had complete demographic data on sex, age, and job type (i.e., full-time or part-time). On the basis of these three criteria, 1,814 participants were included in the analysis, of whom 949 were male (52.3%) and 865 were female (47.7%). The ages of the participants in 2003 ranged from 15 to 76 years, with a mean of 41.92 years and a standard deviation of 10.13 years. In 2003, there were 9 participants >65 years old (0.4%). I kept these older participants in analyses because they were working (primarily in part-time jobs) during the survey period. Excluding these participants did not change the results.

Measures

Job control. Six items were used: "I have many freedom to decide how I do my own work," "I have a lot of say about what happens on my job," "I have a lot of freedom to decide when I do my work," "I have a lot of choice in deciding what I do at work," "My working times can be flexible," and "I can decide when to take a break." These items cover decision-making autonomy, work-methods autonomy and work-scheduling autonomy, three types of autonomy that have been identified in work design research (Morgeson & Humphrey, 2006). The participants used seven-point scales ranging from 1 (strongly disagree) to 7 (strongly agree) to rate themselves on these items. Cronbach's alpha coefficients for these items were all higher than .85 for the entire study period.

Time demand. Three items were used: "I have to work fast in my job," "I have to work very intensely in my job," and "I don't have enough time to do everything in my job." These items have also been used in previous studies (e.g., Bosma et al., 1997; Karasek, 1979). A 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used. Cronbach's alpha coefficients for the items were all higher than .70 for the entire study period.

Job stress. Two items were used: "My job is more stressful than I had ever imagined" and "I fear that the amount of stress in my job will make me physically ill." These items have also been used for measuring job stress in previous studies using the HILDA survey (e.g., Silla & Gamero, 2014). A 7-point scale from 1 (strongly disagree) to 7 (strongly agree) was used. Cronbach's alpha coefficients for these items were all higher than .78 for the entire study period.

Big-five personalities. Descriptive adjectives from Saucier (1994) were used to measure big-five personalities. Neuroticism was measured using "envious," "moody," "touchy," "jealous," "temperamental," and "fretful." Extroversion was measured using "talkative," "bashful" (reversed), "quiet" (reversed), "shy" (reversed), "lively," and "extroverted." Agreeableness was measured using "sympathetic," "kind," "cooperative," and "warm." Conscientiousness was measured using "orderly," "systematic," "inefficient" (reversed), "sloppy" (reversed), "disorganized" (reversed), and "efficient." Openness to experience was measured using "deep," "philosophical," "creative," "intellectual," "complex," and "imaginative." Participants used a 7-point scale from 1 (does not describe me at all) to 7 (describes me very well) to rate themselves on these items. Cronbach's alpha coefficients for the five personality scales were all higher than .74 for the years 2005 and 2009.

Control variables. I included gender and age as time-invariant control variables to predict all of the variables in the analyses and job type (part-time vs. full-time) as a time-variant control variable to predict job-related variables assessed in the same year.

Results

Measurement invariance analysis

I first examined longitudinal invariance of factor loadings and item intercepts of the used measures over time to ensure that the change phenomena captured in this study related to the changes in constructs (true or alpha changes), rather than the changes resulting from scale re-calibration (beta change) or construct re-conceptualization (gamma change) (Golembiewski, Billingsley, & Yeager, 1976). The models were estimated using Mplus (Muthén & Muthén, 2012).

Regarding the job-related measures, I first built a model including five factors of job control, five factors of time demand and five factors of job stress for the five-year data. Each factor was indicated by items assessing the concept in a given year. The errors of the same items repeated over time were allowed to be correlated. The errors of different items were not allowed to be correlated. The factors were allowed to be correlated. This model fit well (ML-χ^2 = 4818.86, *df* = 1223; CFI = .95; TLI = .94; RMSEA = .040; SRMR = .057). I subsequently estimated a model with invariance of factor loadings over time (i.e., factor loadings of the same item across the five years were imposed as equal), and the model fit well (ML-χ^2 = 4838.64, *df* = 1247; CFI = .95; TLI = .94; RMSEA = .040; SRMR = .057). Next, I estimated a model with additional invariance of item intercepts over time (i.e., item intercepts of the same item in the 5-year period were imposed as equal), and the model had similar fit (ML-χ^2 = 4916.58, *df* = 1291; CFI = .95; TLI = .94; RMSEA = .039; SRMR = .058).

Regarding big-five personality, I followed Soto's approach (2015) by creating item parcels for each personality trait in each year and estimated a measurement model with five factors for Time 1 personality measures and five factors for Time 5. Each item parcel was created using two items. As such, except for agreeableness, which has only two-item parcels from four items, there were three-item parcels for other personality traits. Errors of the same item parcels repeated over time were allowed to be correlated. Errors of different item parcels were not allowed to be

correlated. Factors were allowed to be correlated. This model fit well (ML-χ^2 = 1595.04, *df* = 291; CFI = .96; TLI = .94; RMSEA = .050; SRMR = .054). Subsequently, I estimated a model with invariance of factor loadings over time. The model fit well (ML-χ^2 = 1608.18, *df* = 300; CFI = .96; TLI = .94; RMSEA = .049; SRMR = .054). Next, I estimated a model with additional invariance of item intercepts over time (i.e., item intercepts of the same item across the five years were imposed as equal), and the model had a similar fit (ML-χ^2 = 1660.86, *df* = 314; CFI = .95; TLI = .94; RMSEA = .049; SRMR = .055). All of these findings suggested that the measures used were invariant over time.

Hypothesis testing

Table 1 presents descriptive statistics of research variables. To test the proposed hypotheses, I built a hybrid structural equation model that integrates path modeling, latent growth curve modeling (Duncan & Duncan, 2004) and latent differences score modeling (McArdle, 2009). The composite scores of research variables were used to reduce model complexity. This approach is reasonable because measurement validity over time has been supported.

Insert Table 1 Here

Measurement model. I specified direct paths from time demand and job control to job stress in each year. Subsequently, I used latent growth curve modeling to create intercept factors and slope factors for time demand, job control and job stress to represent their initial level at Time 1 and their increases from Time 1 to Time 5, respectively. A linear growth function was specified to capture the individual differences in increasing job stress over time. The slope factor, thus, represents within-individual change from Time 1 to Time 5. Finally, latent differences score modeling was used to create latent difference scores of the big-five personality traits between Time

1 and Time 5. The latent difference scores represent within-individual changes of big-five personality traits.

Consistent with the two-step approach (Anderson & Gerbing, 1998), I first estimated a measurement model without imposing any directional effect on change-related variables. In this model, age and gender were included as time-invariant control variables predicting the latent difference scores of the big-five personality traits, intercept and slope factors of time demand, job control and job stress. Job type (full-time or part-time) in each year was included as a time-variant control variable predicting time demand, job control and job stress in each year. This measurement model was acceptable (ML-χ^2 = 1156.53, *df* = 352; CFI = .97; TLI = .96; RMSEA = .036; SRMR = .057).

Hypothesized model without interaction effects. Based on the measurement model, I first built a model without interaction effects to test Hypotheses 1, 3, and 5. To test Hypothesis 1, I kept the direct paths from time demand and job control to job stress in each year. To test Hypothesis 3, I used the intercept factors and the slope factors of time demand and job control to predict the slope factor of job stress. To test Hypothesis 5, I used both the intercept factor and the slope factor of job stress to predict latent difference scores of big-five personality traits.

In addition to the above specification, I controlled for other effects to provide a more stringent examination on the proposed hypotheses. First, for time demand, job control and job stress, I used the intercept factors to predict their own slope factors to control for their initial status. Second, I used the intercept factors and the slope factors of time demand and job control to predict latent difference scores of big-five personality traits to control for the potential direct effect of change in time demand and job control on personality change. Third, to recognize the potential dispositional effect of personality on changes in the perception of time demand, job control and job stress, I used the big-five personality traits measured at Time 1 to predict the slope factors of those job-

related constructs. Other specifications (e.g., effects of age, gender and job type) were the same as those in the measurement model. Figure 1 presents the specified model. This model fit well (ML-χ^2 = 1135.36, *df* = 345; CFI = .97; TLI = .96; RMSEA = .036; SRMR = .053). Below, I report standardized estimates of this model.

Insert Figure 1 Here

Supporting Hypothesis 1, time demand was associated with higher job stress (γ = .42, .34, .31, .26, .16, $p < .01$ for each year), and job control was associated with lower job stress (γ = -.15, -.13, -.16, -.12, -.13, $p < .01$ for each year). Partially supporting Hypothesis 3, both the intercept factor (γ = .41, $p < .01$) and the slope factor (γ = .37, $p < .01$) of time demand positively predicted the slope factor of job stress; however, both the intercept factor and the slope factor ($p > .10$) of job control did not, suggesting that only time demand, but not job control, can drive change in job stress. Supporting Hypothesis 5, both the intercept factor (γ = .12, $p < .01$) and the slope factor (γ = .33, $p < .01$) of job stress positively predicted the latent differences score of neuroticism, suggesting that having higher job stress in the beginning and increased job stress can drive employees to be more neurotic over time. Additionally, both the intercept factor (γ = -.07, $p < .01$) and the slope factor (γ = -.15, $p < .01$) of job stress negatively predicted the latent differences score of extroversion, suggesting that having higher job stress at the beginning and increased job stress can drive employees to be less extroverted over time. Additionally, I found that both the intercept factor (γ = -.05, $p < .01$) and the slope factor (γ = -.12, $p < .01$) of job stress negatively predicted the latent differences score of conscientiousness, suggesting that having higher job stress at the beginning and increased job stress can drive employees to be less conscientious over time.

The intercept factor and the slope factor of job stress did not predict latent difference scores agreeableness and openness.

Regarding the effect of time demand on big-five personality changes, I found that the intercept of time demand negatively predicted the latent differences score of neuroticism (γ = -.17, p < .01), and positively predicted the latent difference scores of conscientiousness (γ = .08, p < .05). These findings suggest that those having higher time demand at Time 1 become less neurotic and more conscientious over time. Although these findings are seemingly opposite to the indirect effect of time demand on personality change via job stress, they could simply reflect a ceiling effect such that those having higher time demand at Time 1 have felt higher job stress and thus higher neurotic and lower conscientious in the beginning, resulting in limited room for increasing neuroticism or decreasing conscientiousness. Finally, the slope factor of time demands did not predict any latent difference scores of big-five personality traits.

Regarding the effect of job control on big-five personality change, I found that the intercept of job control negatively predicted the latent differences score of agreeableness (γ = -.06, p < .05) and positively predicted the latent differences score of openness (γ = .11, p < .01), revealing that higher job control can lead individuals to become less agreeable but more open to experiences. The slope factor of job control positively predicted the latent difference scores of agreeableness (γ = .10, p < .01), conscientiousness (γ = .09, p < .01) and openness (γ = .14, p < .01), suggesting that increasing job control can results in an increase in agreeableness, conscientiousness and openness. There was no significant effect of job control on driving personality change in neuroticism and extroversion.

Regarding the dispositional effects, I found that neuroticism at Time 1 negatively predicted the slope factor of job control (γ = -.12, p < .01) and positively predicted the slope factor of job stress (γ = .10, p < .01). In other words, those higher in neuroticism at Time 1 are more likely to

perceive less job control and experience more job stress over time. Conscientiousness at Time 1 negatively predicted the slope factor of job stress (γ = -.07, p < .05), suggesting that conscientious individuals tend to experience less job stress over time. Agreeableness at Time 1 negatively predicted the slope factor of job control (γ = -.11, p < .01), suggesting that agreeable individuals tend to perceive less job control over time. Openness at Time 1 positively predicted the slope factor of time demand (γ = .12, p < .01) and job control (γ = .12, p < .01) and negatively predicted the slope factor of job stress (γ = -.12, p < .01). These findings suggest that those high in openness tend to perceive more time demand and job control over time but experience less job stress in the same time period.

Hypothesized model with interaction effects. Based on the first model, I additionally included interaction effects between job control and time demand on job stress in each year to test Hypothesis 2 and an interaction effect between the slope factors of job control and time demand on the slope of job stress to test Hypothesis 4. I used latent moderated structural (LMS) equations (Klein & Moosbrugger, 2000) implemented in Mplus (Muthén & Muthén, 2012) for estimation. I used likelihood ratio test to confirm that the model with interaction effects is better than a model when interaction effects were fixed as 0 (Δ 2LL [df=6] = 14.45, p < .05). Nevertheless, in this model, the interaction effect between job control and time demand on job stress was only negatively significant at Time 1 (unstandardized effect = -.04, p < .05) and Time 5 (unstandardized effect = -.05 p < .01), suggesting that job control can weaken the positive effect of time demand on job stress in these two waves, partially supporting Hypothesis 2. The interaction effect between the slope factors of job control and time demand on the slope of job stress was not significant, failing to support Hypothesis 4.

Alternative model. To ensure that the proposed bottom-up process of personality change is plausible, I examined an alternative model in which the slope factors of time demand, job control

and job stress were predicted by (rather than predicting) the latent difference scores of Big-five personality traits. Interaction effects were not examined to simplify the model. Other specifications were the same as those in the hypothesized model without interaction effects. This alternative model, thus, suggests that changes in job features are influenced by changes in personality over time. Although this alternative model fit well (ML-χ^2 = 1662.28, *df* = 355; CFI = .95; TLI = .93; RMSEA = .045; SRMR = .055), it had a higher AIC value (AIC = 121992.445) (an index for model comparison; the lower the AIC value is, the better fit to the data) than the hypothesized model without interaction effects (AIC = 121485.522), suggesting that the hypothesized bottom-up process is more plausible.

Discussion

Supporting the proposed bottom-up process of personality change, the results of this study indicated that time demand and job control shape job stress experiences, and over time, an increase in time demand, in particular, leads to an increase in job stress, which, in turn, tends to make employees more neurotic and less extroverted over five years. Although the findings also indicated that a change in job control can predict changes in Big-five personality, those changes did not predict changes in neuroticism and extroversion. These findings suggest that job stress is the key job feature that drives changes in these two personality dimensions, which is consistent with the expectation based on Gray's biopsychological theory of personality (1981; 1990). Moreover, I found that the buffering effect of job control on the association between time demand and job stress only operated in a concurrent process (i.e., analysis based on of variables in each wave) rather than a change process (i.e., analysis based on of latent slope factors over five waves).

This study extended personality development research in several ways. First, although work design factors (e.g., job autonomy and job complexity) have been theorized and empirically linked to personality change in several studies (e.g., Kohn & Schooler, 1982; Li et al., 2014; Wu

et al., 2015), the role of work experiences influenced by work design factors in shaping personality change has not been examined. This study extended previous research by empirically examining the important role of work experiences, or job stress precisely, in linking the association between work design factors (i.e., time demand and job control) and personality change (changes in neuroticism and extroversion).

Second, as mentioned earlier, one aim of this study was to consider work environment/experience changes as a driver for personality change, and findings have supported the expectation that changes in the work environment/experiences can predict changes in personality. Although it is arguable that such a directional effect is not conclusive because changes in personality can also lead to changes in one's perception of their work environment and experiences, the results of the model comparison suggested that the model with the proposed directional effects is better than the model with the opposite. Although more rigorous tests are needed, the findings of this study at least suggested that we cannot ignore the role of changes in work environment/experiences in evoking personality change because it could be an important reason why an individual changes her/his idiosyncratic way of thinking, feeling and behaving. In other words, personality change can be viewed as an adaption process in which an individual changes her/his way to interact with the environment (Savickas, 1997, 2005). To date, personality development research primarily focuses on whether the environment factor at a given time can lead to personality change and ignores the power of environmental/experience changes in driving personality development. Because people only accommodate their environmental/experiences when they cannot use the existing approach to interact with their environment and understand their experiences (Piaget, 1963), environmental/experience changes should play an important role in effecting personality change.

Third, this study suggests a stress-related biological mechanism in driving personality change. To date, the mechanisms of personality change have been understood from cognitive and behavioral perspectives such that personality change relates to how individuals view themselves (e.g., Wu & Griffin, 2012; Wu et al., 2015) and/or behavioral habituation (e.g., Li et al., 2014; Lodi-Smith & Roberts, 2007). This study offers a biological stress-response mechanism to understand why personality traits, especially the traits of neuroticism and extroversion, can change and what drives such change. Based on Gray's biopsychological theory of personality (1981; 1990) and recent research on stress and biological functions (e.g., Ellis & Boyce, 2005) and the biological foundation of Big-five personality traits (e.g., Allen & DeYoung, In press; DeYoung & Gray, 2009), it is likely that job stress evokes changes in the operation of biological functions, subsequently resulting in changes in Big-five personality traits, which should be further explored.

Fourth, by including dispositional effects in the proposed model, this study offers a dynamic modeling to understand the potential reciprocal associations between Big-five personality traits and job features. Supporting the corresponding principle of personality development such that life experiences influence personality traits that lead people to find these experiences in the first place (Caspi, Roberts, & Shiner, 2005), I found that employees who score high in neuroticism are more likely to experience an increase in job stress, which makes them tend to be more neurotic. However, the principle cannot be applied to explain all results in this study. One potential reason to explain these inconsistencies is that the corresponding principle emphasizes the agency of individuals in driving personality change via environment selection; however, such dispositional agency is not the only force that evokes personality change. As discussed earlier, it is likely that external environment changes can trigger a personality change process for adaptation, in which dispositional agency in environment selection may not play a strong role in driving the change process. As such, the present study provides a different view from the corresponding principle of

personality development in theorizing the link between the environment and personality in a process of change.

This study indicates that time demand and job stress can have a long-term impact on personality change. Work design has usually been regarded as a motivational tool to shape employees' work behavior or an approach to facilitate employees' occupational health (Parker, 2014). Its function on personality development, although it has been proposed (e.g., Brousseau, 1983; Frese, 1982), has been neglected in the literature. Consistent with the results of other empirical studies (e.g., Kohn & Schooler, 1982; Li et al., 2014; Wu et al., 2015), this study indicated that work design features can have a long-term impact on employees' personality, deep and core dispositional attributes. The developmental function of work design, thus, reinforces organizations' social corporate responsibility in facilitating the well-being and development of employees and society. More specifically, I found that the increase of time demand, but not the increase of job control, can predict the change of job stress and then changes in neuroticism and extroversion, suggesting that the management of time demand should be a priority. Nevertheless, it does not mean that job control did not play a role in stress prevention and personality change. As I reported, both job control and time demand in a given year can predict stress experiences in the same year and job control can weaken the link between time demand and job stress (at least in the reported two waves); job control, thus, involves the processes of stress prevention and personality change by shaping one's stress experiences concurrently. In other words, having higher job control can still help employees to experience less job stress and weaken the stress-evoked mechanism in driving personality change.

There are several limitations of this study. First, only two items were used for assessing job stress and the Big-five personality measurement based on adjectives did not cover the whole facets that have been identified in the Big-five personality framework (e.g., Costa & McCrae,

1992). Future studies are encouraged to use alternative measurements for both job stress and Big-five personality. Second, measures of time demand, job control and job stress were assessed in the same section in the self-completion survey, which may exacerbate common method bias. The same concern also applied to personality measures. Although acknowledging such concern, the results of measurement models have demonstrated discriminant validity of the used measures. Moreover, the variables of the three job features have different associations with personality variables, which cannot be explained by the effect of common method bias. Third, the current study cannot fully ensure whether it is the change of job features that trigger personality change or the opposite because I only focused on change within a certain time period. A research design with multiple time periods would be ideal to unpack the directional effects between work environment/experience changes and personality changes (Selig & Preacher, 2009). Finally, the proposed biological stress-response mechanism in shaping changes in neuroticism and extroversion was not empirically examined. Having biological data relating to stress responses is, thus, desired to fully corroborate the proposed mechanism.

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Table 1.
Descriptive statistics

			Correlations															
	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Sex (Female)	1.48	0.50																	
2. Age (T1)	41.9	10.1	.08																
3. Job type (T1)	1.22	0.41	.41	.05															
4. Job type (T2)	1.21	0.41	.38	.08	.78														
5. Job type (T3)	1.19	0.40	.36	.14	.72	.76													
6. Job type (T4)	1.20	0.40	.37	.16	.65	.68	.77												
7. Job type (T5)	1.21	0.41	.35	.17	.58	.62	.68	.74											
8. Neuroticism (T1)	2.83	1.06	-.09	-.15	-.04	-.03	-.06	-.04	-.04										
9. Neuroticism (T5)	2.70	1.02	-.09	-.15	-.02	-.03	-.04	-.05	-.04	.68									
10. Extroversion (T1)	4.36	1.08	.16	.00	.08	.06	.06	.05	.04	-.19	-.13								
11. Extroversion (T5)	4.34	1.08	.15	.01	.04	.03	.04	.04	.04	-.15	-.17	.78							
12. Agreeableness (T1)	5.35	0.89	.31	.11	.12	.12	.10	.12	.09	-.19	-.21	.15	.12						
13. Agreeableness (T5)	5.36	0.87	.30	.09	.12	.11	.08	.11	.09	-.19	-.21	.16	.14	.69					
14. Conscientiousness (T1)	5.19	0.99	.15	.12	-.01	.01	.01	.02	.04	-.27	-.23	.15	.09	.28	.20				
15. Conscientiousness (T5)	5.25	0.96	.16	.08	.01	.01	.01	-.01	.02	-.23	-.28	.12	.12	.20	.27	.73			
16. Openness (T1)	4.18	1.01	-.04	-.01	-.06	-.05	-.07	-.05	-.04	.19	.11	.02	.00	.24	.15	.07	.02		
17. Openness (T5)	4.11	1.04	-.05	-.01	-.05	-.04	-.06	-.04	-.03	.12	.18	.04	.03	.16	.24	.06	.07	.74	
18. Job autonomy (T1)	4.06	1.42	-.11	.02	-.07	-.07	-.05	-.07	-.09	-.07	-.08	.11	.10	.02	-.02	.07	.04	.11	.13
19. Job autonomy (T2)	4.02	1.38	-.11	.01	-.07	-.06	-.05	-.07	-.07	-.05	-.05	.06	.05	-.01	-.05	.05	.03	.12	.15
20. Job autonomy (T3)	4.08	1.41	-.11	.00	-.10	-.07	-.08	-.09	-.09	-.04	-.06	.08	.08	-.02	-.07	.05	.03	.11	.14
21. Job autonomy (T4)	4.15	1.41	-.12	-.03	-.09	-.08	-.07	-.09	-.10	-.07	-.06	.09	.08	-.03	-.06	.06	.05	.11	.15
22. Job autonomy (T5)	4.08	1.44	-.11	-.02	-.08	-.06	-.06	-.07	-.09	-.07	-.07	.09	.09	-.02	-.02	.05	.06	.12	.17
23. Time demand (T1)	4.71	1.27	.03	-.01	-.13	-.12	-.13	-.09	-.07	.08	.03	-.01	.00	.04	.06	.05	.06	.17	.15
24. Time demand (T2)	4.73	1.28	.09	-.03	-.09	-.11	-.11	-.07	-.07	.04	.01	.01	.01	.08	.07	.04	.05	.19	.17
25. Time demand (T3)	4.70	1.31	.08	-.05	-.07	-.07	-.12	-.08	-.07	.07	.02	.01	.01	.08	.07	.03	.03	.17	.15
26. Time demand (T4)	4.73	1.29	.09	-.05	-.05	-.07	-.11	-.09	-.07	.03	.00	-.01	.01	.08	.07	.05	.05	.15	.15
27. Time demand (T5)	4.66	1.32	.09	-.08	-.08	-.08	-.12	-.10	-.10	.05	.04	.01	.02	.06	.07	.02	.04	.16	.17
28. Job stress (T1)	3.07	1.46	-.05	.02	-.14	-.13	-.13	-.09	-.07	.30	.20	-.11	-.09	-.07	.00	-.12	-.07	.14	.13
29. Job stress (T2)	2.95	1.43	-.03	.00	-.15	-.15	-.14	-.12	-.10	.22	.19	-.09	-.08	-.07	-.05	-.09	-.09	.13	.12
30. Job stress (T3)	2.76	1.45	.03	-.03	-.10	-.11	-.15	-.10	-.08	.21	.20	-.09	-.10	-.01	-.01	-.08	-.08	.14	.13
31. Job stress (T4)	2.99	1.46	.01	.03	-.08	-.09	-.11	-.11	-.09	.20	.20	-.08	-.11	-.06	-.03	-.08	-.08	.13	.12
32. Job stress (T5)	2.85	1.46	.04	-.02	-.08	-.09	-.12	-.11	-.10	.20	.24	-.09	-.11	-.05	-.01	-.11	-.11	.12	.14

Table 1. (cont.)
Descriptive statistics

	Correlations													
	18	19	20	21	22	23	24	25	26	27	28	29	30	31
18. Job autonomy (T1)														
19. Job autonomy (T2)	.72													
20. Job autonomy (T3)	.70	.73												
21. Job autonomy (T4)	.65	.70	.74											
22. Job autonomy (T5)	.65	.70	.72	.76										
23. Job demand (T1)	.00	.02	.00	.02	.01									
24. Job demand (T2)	.00	.03	.01	.02	.05	.60								
25. Job demand (T3)	-.04	.00	-.01	-.01	.02	.55	.63							
26. Job demand (T4)	-.03	.02	.02	.02	.01	.52	.58	.64						
27. Job demand (T5)	-.01	.01	.01	-.01	.01	.52	.57	.60	.68					
28. Job stress (T1)	-.15	-.06	-.09	-.10	-.09	.46	.35	.30	.29	.29				
29. Job stress (T2)	-.10	-.11	-.09	-.11	-.08	.34	.43	.32	.32	.30	.56			
30. Job stress (T3)	-.17	-.12	-.16	-.15	-.12	.31	.33	.44	.35	.33	.53	.57		
31. Job stress (T4)	-.13	-.09	-.10	-.14	-.10	.31	.34	.37	.46	.40	.50	.53	.61	
32. Job stress (T5)	-.12	-.10	-.10	-.12	-.15	.26	.29	.28	.36	.43	.46	.50	.55	.61

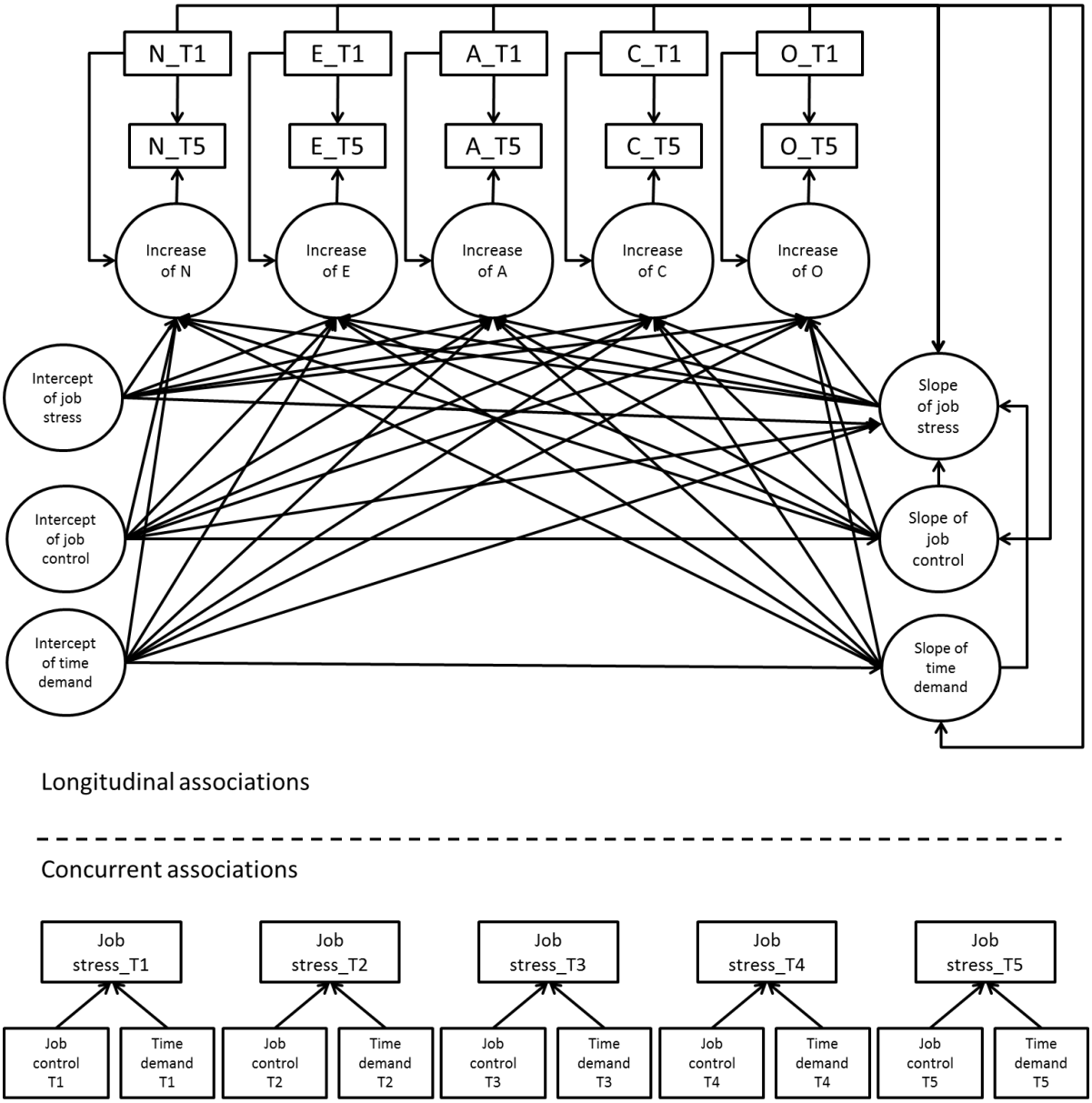

Figure 1
The proposed bottom-up process model.
Note. For simplicity, effects of age, gender, and job type and measurement specification of the intercept factors and the slope factors of time demand, job control and job stress were skipped in the figure. The intercept factors and the slope factors of time demand, job control and job stress were created from measures of each construct over five years. All relationships were specified and estimated in the proposed model.